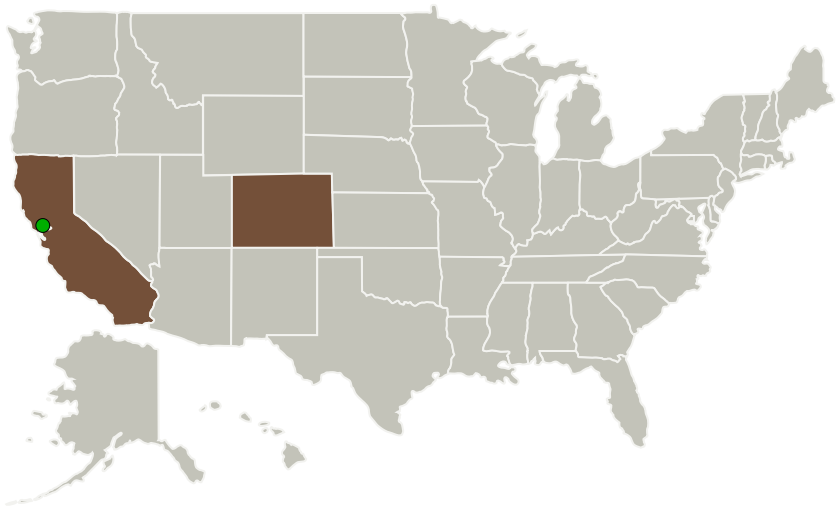
Low-Inertia STEM Arm (LISA) Manipulators for Assistive Free-Flyers, Phase I

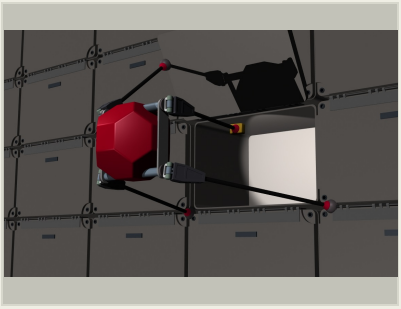
Completed Technology Project (2015 - 2015)

Project Introduction

Altius Space Machines proposes the development of lightweight robotic manipulators, that utilize rollable composite STEM booms to provide a prismatic extension/retraction DOF, as robot arms for Assistive Free-Flyers (AFFs) on the International Space Station. These Low-Inertia STEM Arm (LISA) manipulators can provide comparable or better manipulation capabilities to AFFs than traditional robotic manipulators, but with less mass, lower inertial, better stowability, and the ability to reach into very hard-to-access locations. In Phase I, Altius and its partners will gather potential use cases for manipulator-equipped AFFs, derive system requirements and develop a conceptual design for the LISA manipulators, and develop a proof-of-concept prototype of the small STEM boom deployers for the LISA manipulators. This will raise the system TRL from 2 to 3. In Phase II, Altius and its partners will develop a prototype flight-set of LISA manipulators and interface hardware to connect them to the SPHERES testbeds on ISS, and will support the necessary ISS safety review meetings to get flight approval by the end of Phase II. Successful flight demonstration in a Phase II-E or II-X option would raise the system TRL to 8, at which point it could be smoothly integrated into operational AFFs such as the ones NASA STMD is currently developing.

Primary U.S. Work Locations and Key Partners





Low-Inertia STEM Arm (LISA) Manipulators for Assistive Free-Flyers, Phase I

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Organizations Performing Work	Role	Type	Location
Altius Space Machines, Inc.	Lead Organization	Industry	Broomfield, Colorado
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Colorado

Project Transitions

June 2015: Project Start

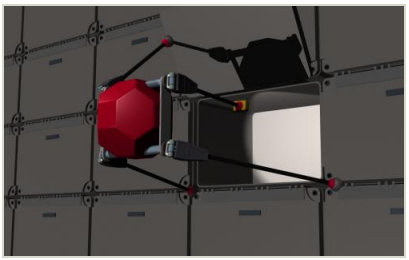
December 2015: Closed out

Closeout Summary: Low-Inertia STEM Arm (LISA) Manipulators for Assistive F ree-Flyers, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139188)*

Images



Briefing Chart Image
Low-Inertia STEM Arm (LISA) Manipulators for Assistive Free-Flyers, Phase I
(https://techport.nasa.gov/image/128135)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Altius Space Machines, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

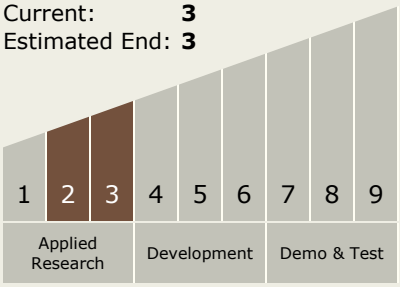
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jonathan A Goff

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Low-Inertia STEM Arm (LISA) Manipulators for Assistive Free-Flyers, Phase I

Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.3 Contact Dynamics Modeling

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System